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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

7434-2

U.S. APPLICATION NO. (If known, give 37 CFR 1.5

09/936688

INTERNATIONAL APPLICATION NO.

PCT/GB00/01160

INTERNATIONAL FILING DATE

March 27, 2000

PRIORITY DATE CLAIMED

March 26, 1999

TITLE OF INVENTION

FLAVOURING OR AROMATISATION OF AN INFUSION

APPLICANT(S) FOR DO/EO/US

John Robinson

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☐ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

## Items 11 to 20 below concern document(s) or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☒ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☒ Other items or information: *Int. Prel. Exam. Report*

"Express Mail" label number EL683237825US. Date of Deposit 9-17-2001 I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR § 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231

page 1 of 2

*Raid meron*  
Signature of Person Mailing Correspondence

U.S. APPLICATION FOR PATENT INTERNATIONAL APPLICATION NO  
PCT/GB00/01160

ATTORNEY'S DOCKET NUMBER

7434-2

21. ☐ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):**

Neither international preliminary examination fee (37 CFR 1.482)  
nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO  
and International Search Report not prepared by the EPO or JPO. .... \$100.00

International preliminary examination fee (37 CFR 1.482) not paid to  
USPTO but International Search Report prepared by the EPO or JPO ..... \$860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO  
but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO  
but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO  
and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$100.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =****CALCULATIONS PTO USE ONLY**

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(e)).

\$

**CLAIMS****NUMBER FILED****NUMBER EXTRA****RATE**

\$

Total claims

20 - 20 =

0

x \$18.00

\$

Independent claims

2 - 3 =

0

x \$80.00

\$

MULTIPLE DEPENDENT CLAIM(S) (if applicable)

+ \$270.00

\$

**TOTAL OF ABOVE CALCULATIONS =**

\$ 860.00

☒ Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above  
are reduced by 1/2.

+

\$ 430.00

**SUBTOTAL =**

\$ 430.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30  
months from the earliest claimed priority date (37 CFR 1.492(f)).

\$

**TOTAL NATIONAL FEE =**

\$ 430.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be  
accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

**TOTAL FEES ENCLOSED =**

\$ 430.00

Amount to be  
refunded:

\$

charged:

\$

- a. ☒ A check in the amount of \$ 430.00 to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \$ \_\_\_\_\_ to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any  
overpayment to Deposit Account No. 23-3030. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card  
information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR  
1.137 (a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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NAME

28,309

REGISTRATION NUMBER

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of: ) Express Mail No. EL683237825US  
)  
John Robinson )  
)  
Serial No. (unknown) )  
)  
Filed Herewith )  
)  
FLAVOURING OR AROMATISATION )  
OF AN INFUSION )  
)  
US National Stage of PCT/GB00/01160 )  
International Filing Date March 27, 2000 )

**PRELIMINARY AMENDMENT**

Hon. Assistant Commissioner of Patents

Washington, D.C. 20231

Sir:

Please enter the following Preliminary Amendment in the above-identified patent application. The Commissioner is hereby authorized to charge payment of any additional fees associated with this application or credit any overpayment to Deposit Account No. 23-3030.

**IN THE CLAIMS**

Please amend the claims to read as follows:

"Express Mail" label number EL683237825US, Date of Deposit September 17, 2001. I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR § 1.10 on the date indicated above and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

*Gail Mercer*  
\_\_\_\_\_  
Signature of Person Mailing Correspondence

## Clean Copy of Amended Claims

### CLAIMS

1. A process for the flavouring or aromatisation of product to be infused comprising the steps of producing encapsulated particles of flavour, bonding the particles to a porous carrier using a dosing process to control the distribution of particles on the carrier, and introducing the product into the carrier, characterised in that the dosing process is a metered printing process.
2. A process according to claim 1, wherein the carrier is a cellulose-based material.
3. A process according to claim 1, wherein the flavouring is encapsulated by a capsule that is soluble in water within a predetermined temperature range.
4. A process according to claim 1, wherein the flavour is encapsulated in a polysaccharide that has adhesive properties.
5. A process according to claim 4 wherein the polysaccharide is a modified starch that has adhesive properties.
6. A process according to claim 5, wherein the modified starch is an n-octenyl succinate modified starch.
7. A process according to claim 1, wherein the flavour is encapsulated in an encapsulant material that also performs as an emulsifier during the production of the encapsulated particles of flavour.
8. A process according to claim 1, wherein the flavouring is encapsulated by a capsule that is frangible within a pre-determined temperature range.

9. A process according to claim 8, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said pre-determined temperature range so as to induce rupture of said capsule.

10. A process according to claim 8, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

11. An infusion product comprising a porous carrier containing matter to be infused and encapsulated flavour particles bonded to said carrier by using a metered printing process that controls the distribution of particles on the carrier.

12. An infusion product according to claim 11, wherein the encapsulated flavour particles comprise an outer capsule of polysaccharide with adhesive properties.

13. An infusion product according to claim 12, wherein the polysaccharide is a modified starch.

14. An infusion product according to claim 13 wherein the modified starch is an n-octenyl succinate modified starch.

15. An infusion product according to claim 14, wherein the polysaccharide is a natural gum.

16. An infusion product according to claim 15, wherein the capsule is frangible within a predetermined temperature range.

17. An infusion product according to claim 16, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said predetermined temperature range so as to induce rupture of said capsule.

18. An infusion product according to claim 16, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

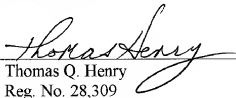
19. A process according to claim 9, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

20. An infusion product according to claim 17, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

**REMARKS**

Consideration and allowance of the above-identified patent application is requested.

Respectfully submitted,

By:   
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DE/HS/J088373PUS-TQH:141508

**Version with Markings to Show Changes Made**

1. A process for the flavouring or aromatisation of product to be infused comprising the steps of producing encapsulated particles of flavour, bonding the particles to a porous carrier using a dosing process to control the distribution of particles on the carrier, and introducing the product into the carrier, characterised in that the dosing process is a metered printing process.

2. A process according to claim 1, wherein the carrier is a cellulose-based material.

3. A process according to [any preceding] claim 1, wherein the flavouring is encapsulated by a capsule that is soluble in water within a predetermined temperature range.

4. A process according to [any preceding claim] claim 1, wherein the flavour is encapsulated in a polysaccharide that has adhesive properties.

5. A process according to claim[s 3 or] 4 wherein the polysaccharide is a modified starch that has adhesive properties.

6. A process according to claim 5, wherein the polysaccharide modified starch is an n-octenyl succinate modified starch.

7. A process according to [any one of] claim[s 4 to 6] 1, wherein the flavour is encapsulated in an encapsulant material that also performs as an emulsifier during the production of the encapsulated particles of flavour.

8. A process according to [any one of] claim[s] 1 [or 2], wherein the flavouring is encapsulated by a capsule that is frangible within a pre-determined temperature range.



9. A process according to claim 8, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said pre-determined temperature range so as to induce rupture of said capsule.

10. A process according to claim 8 [or 9], wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

11. An infusion product comprising a porous carrier containing matter to be infused and encapsulated flavour particles bonded to said carrier by using a metered printing process that controls the distribution of particles on the carrier.

12. An infusion product according to claim 11, wherein the encapsulated flavour particles comprise an outer capsule of polysaccharide with adhesive properties.

13. An infusion product according to claim 12, wherein the polysaccharide is a modified starch.

14. An infusion product according to claim 13 wherein the modified starch is an n-octenyl succinate modified starch.

15. An infusion product according to claim 14, wherein the polysaccharide is a natural gum.

16. An infusion product according to claim 15, wherein the capsule is frangible within a predetermined temperature range.

17. An infusion product according to claim 16, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said predetermined temperature range so as to induce rupture of said capsule.

18. An infusion product according to claim 16 [or 17] wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

19. A process according to claim 9, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

20 An infusion product according to claim 17 wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

FLAVOURING OR AROMATISATION OF AN INFUSION

The present invention relates to a method for the flavouring or aromatisation of an infusion and more particularly to a method for producing a product that is used to make a flavoured or aromatized infusion such as, for example, a tea beverage.

It is well known to flavour or aromatise vegetable matter with natural or synthetic flavours. In the case of tea, the leaves are often flavoured or aromatised with essential oils such as bergamot or jasmine or, in some countries, spices such as mint or cardamom. In recent years there has been an increase in popularity of fruit flavoured teas such as, for example, strawberry, raspberry, lemon, blackcurrant or peach.

Flavouring or aromatisation is also used in some instances to prolong the storage life of tea without impairing its taste.

Flavouring of tea can be performed by spraying a liquid flavour in an inert edible solvent directly on to a fluidised bed of tea leaves. An example of this technique is described in EP-A-0070719. However, this method has a disadvantage in that the flavouring solution has a tendency to evaporate from the surface of the sprayed leaves during subsequent drying, storage, transportation or handling. The evaporation of the solution leads to the loss of the top notes of flavour in the resulting infusion.

In an alternative method the flavouring takes the form of solid particles that are mixed with the tea leaves on a fluidised bed (as referred to above). A disadvantage of this method is that there is a tendency for the flavour particles to separate from the leaves under the effect of gravity during storage, transportation or handling. In addition, the flavour particles tend to egress through the walls of the tea bags in which they are contained.

In both the aforementioned methods the disadvantages lead to a tea product that has a non-uniform flavour.

US-A-4880649 describes a process for flavouring an edible composition in the form of leaves, powders or particles. The composition is flavoured with an emulsion containing an active volatile flavouring substance that is non-miscible with water. The

emulsion is applied by direct spraying on to the exposed surface of the composition or a carrier package for the composition (such as a tea-bag or a filter) and comprises the flavouring substance, an aqueous solution of a film-building water soluble vehicle and an emulsifying agent. The flavouring substance is initially retained on the surface of the composition by adhesion of the emulsion as a result of the bonding effect of the film-building vehicle. After the sprayed composition is dried (for example, by evaporation or absorption of the water used in preparing the emulsion) the flavouring substance is incorporated within a protective water-soluble dry layer of the film-building vehicle. In use, when the sprayed composition or carrier is immersed in water the film-building vehicle dissolves in water so as to release the flavouring substance. A disadvantage of this process is that the flavour may not be uniformly distributed throughout the composition. Whilst the method does address part of the problem of flavour evaporation, some of the flavouring substance that is exposed at the surface of the film coating will nevertheless evaporate during the drying process.

EP-A-0499858 describes a process for the aromatisation of vegetable matter such as tea using particulate micro-encapsulated flavour. Micro-encapsulated flavour powders are produced by spray-drying as a liquid on to a maltodextrin support and the particles are sieved so as to remove the smallest. Peanut oil is then mixed with the flavour particles to provide a coating which increases the particle size and the tendency of the particles to agglomerate. The coated flavour is mixed with the tea leaves and placed within tea bags. The coated, agglomerated particles are too large to egress through the walls of the tea bag material during packing and handling. When the bag is infused the peanut oil is dispersed and the flavour is released so as to pass through the bag material. This process has several disadvantages. First, the strength of a particular infusion depends on the distribution of the mix prior to bagging. The coated flavour particles will tend to separate from the tea leaves under gravitational action prior to bagging, particularly during transportation. Moreover, the peanut oil tends to pass through the bag during the infusion process and may influence the flavour or appearance of the infused beverage. In addition, since a tea manufacturer will generally produce a range of teas with different flavours the tea leaves are

generally mixed with the flavouring in relatively small batches and there is a risk of cross-contamination between batches having different flavourings.

HU-A-0039343 discloses a process for the preparation of a tea bag whereby a flavouring substance encapsulated in cyclodextrin is incorporated with binders into an aqueous solution. The solution is applied to the tea bag paper and dried so that the encapsulated particles bind to the paper.

It is an object of the present invention to obviate or mitigate the aforesaid disadvantages.

According to a first aspect of the present invention there is provided a process for the flavouring or aromatisation of product to be infused comprising the steps of producing encapsulated flavour particles, bonding the particles to a porous carrier and introducing the product into the carrier, characterised in that the dosing process is a metered printing process.

The term "particle" or "particles" is used herein to cover an encapsulated solid particle or liquid droplet of flavouring.

The terms "capsule", "encapsulant", "encapsulated" and "micro-encapsulated" are used herein to refer to any flavour oil bound within a flavour carrying matrix, regardless of whether said matrix forms a capsule in the classical sense.

The carrier may be constructed of cellulose-based material such as that used in the manufacture of tea bags. It may be constructed, for example, of cellulose or a mixture of cellulose material and a polyolefin.

The particles may be suspended or in a liquid solution for this purpose.

The flavour may be conveniently encapsulated in a polysaccharide so that the capsule has adhesive properties that allow it to bond to the carrier. In one preferred embodiment the polysaccharide is a modified starch and more preferably an n-octenyl-succinate modified starch.

Preferably the capsule is soluble in water within a predetermined temperature range. Alternatively the flavour is encapsulated by a capsule that is frangible within a pre-determined temperature range so that the flavour is released when infused in fluid within or above that particular temperature range.

The flavouring in the capsule is conveniently designed to increase in internal vapour pressure within said pre-determined temperature range so as to induce rupture of said capsule. In addition, or in the alternative, the capsule may have a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

According to a second aspect of the present invention there is provided an infusion product comprising a porous carrier containing matter to be infused and encapsulated flavour particles bonded to said carrier by using a metered printing process that controls the distribution of particles on the carrier.

In a first embodiment micro-encapsulated flavouring particles are formed by a known coascervation method and are dissolved in an aqueous solution. Each capsule contains flavouring oils and is hermetically sealed by an outer wall of entirely edible gel or gum-based material. The size of the capsule is accurately determined during manufacture so that the concentration of the flavouring oil in use is controlled.

The micro-encapsulated particles are applied to a porous cellulosic (or a combination of cellulose and polyolefin) material from which tea-bags or the like are manufactured by a known dosing process such as metered printing (e.g. rotogravure printing). After printing, the water is absorbed, dried and/or evaporates leaving the capsules bonded to the surface of the material. The capsules are designed not to rupture under external mechanical stress during processing.

The material is then cut into tea bag form, filled with tea leaves and sealed in a conventional manner.

In use, the tea-bag is infused in hot water in the usual way. As the capsules are heated by the water there is a continual weakening of the capsule wall strength and simultaneously a continual increase in the internal vapour pressure of the flavoured oil within the capsule. When the temperature of the capsule is within a predetermined temperature range the combined effect of increasing internal pressure and the weakening of the capsule walls results in catastrophic failure of the capsule material.

The oil is instantaneously released, passes through the tea bag material and into the water. The capsule material is designed to dissolve in the water after rupture.

There are many advantages to using the process of the present invention in the production of flavoured products (such tea) for infusion. First, the amount of flavouring oil per tea bag can be carefully controlled as a result of the micro-encapsulation process and dosing process. The micro-encapsulation process provides careful metering of the size of oil droplet in each capsule. If an engraved metering roller (such as that used in gravure printing) is used in the printing process to apply the particles to the bag material the quantity of capsules per unit surface area of the bag material can be controlled. The control of the capsule size and their distribution over the bag enables tea-bags to be produced with flavour characteristics that are reproducible between batches. Secondly, since there is no need to subject the tea leaves to a flavour coating or mixing process not only is the tea production procedure simplified but also there is no risk of cross contamination of flavours between batches of tea. Indeed the tea can be bagged in larger batch sizes in view of the elimination of the mixing or coating stage. Thirdly, the elimination of evaporation of the flavouring oil by using hermetically sealed capsules prevents the loss of top notes of flavour. Notwithstanding this, the oil can be pre-treated by, for example, heating to remove the flavour top notes prior to encapsulation if it is desired to simulate the flavour of a conventional tea infusion.

The micro-encapsulation of the flavouring oil ensures that it is hermetically sealed so that if the tea bag is used after prolonged storage the flavour of the infusion remains fresh without the need for special flavour-retaining packaging.

In a second embodiment the flavour is encapsulated in a modified starch compound, preferably an n-octyl succinate modified starch, which may or may not be pre-gelatinised, by mixing, preferably high shear mixing, in an aqueous environment. Further ingredients, such as a weighting agent, preservative and/or citric acid may also be added. Preferred weighting agents are sucrose esters, especially sucrose acetate isobutyrate, rosin esters and polyol bezoates, preferred preservatives are sodium benzoate or potassium sorbate. Citric acid may be added in various quantities

dependent upon the desired tartness of the finished product. The weighting agent, if used, is mixed with the flavouring oil prior to encapsulation by the starch, the resulting mixture being neutrally buoyant with respect to water, to reduce further any tendency the emulsion may have for separation.

The encapsulated flavour oil mixture is then applied (possibly in diluted form) to a porous cellulosic (or a combination of cellulose and polyolefin) material from which tea bags or the like are manufactured by a known dosing process such as metered printing. After printing the water is absorbed, dried and/or evaporates leaving the starch bound to the surface of the cellulosic material, with the flavour oil entrained by the starch.

In use, a tea bag made from material treated in this manner is infused in hot water. As the starch is heated it becomes detached from the tea bag material and solubilises the flavour oil into the body of the beverage, thus releasing the flavour oil into the drink.

The process of the present invention provides for a simplified procedure for producing an infusion product with improved quality.

Specific embodiments of the present invention will now be described, by way of illustration only, with reference to the following example.

#### EXAMPLE 1

A batch of earl grey tea was made using bergamot oil as the flavouring. A coascervation micro-encapsulation process was performed using 1 kg of bergamot oil and 5.02kg of other ingredients (principally de-ionised water) to form 6.02kg of aqueous solution with micro-capsules. A quantity of 0.3% to 5% of colloids comprising a suitable non-toxic food-safe natural gum and a specific gelatine with a suitable isoelectric point were dissolved in 40% to 90% of deionized water and conditioned with suitable reagents including emulsifiers. Following a brief period of heating to 26°C to 60°C, a quantity of 5% to 50% of bergamot oil was rapidly added and sufficiently agitated to produce droplets of an average diameter of 15 $\mu$  (the majority being within a range of 5 to 25 $\mu$ ). The resulting mixture is adjusted to a pH level of between 4.2 and 8.0 to induce a controlled precipitation of the colloids at the



boundary between the water and the bergamot oil. Following a period of stirring, the mixture was allowed to cool gradually to ambient temperature and then force-chilled to 5 to 18°C leaving a plurality of capsules filled with droplets of bergamot oil. Following a further period of stirring of 10 to 90 minutes 0.5% to 15% of a rheology modifying natural gum colloid was added and dispersed so as to form a first coating over the existing capsules. Thereafter 0.05% to 15% of rheology modifying gum was added and dispersed to form a second coating over the outside of the first coating. This gum may or may not be the same as that mentioned above and is again non-toxic and food-safe. The first and second coatings of the capsules facilitate application of the capsules to the tea bag material during a subsequent dosing process described below and dictate the strength of bond of the capsule to the tea bag material.

The tea bag material was manufactured in a conventional manner and the solution of micro-encapsulated droplets was applied thereto in measured doses by a flexographic printing process. In the particular process used here an "inking" roller turns within a reservoir of solution (which is constantly agitated). The gum coatings on the capsules enable them to adhere to the inking roller so that they are pulled out of the reservoir by the roller which then applies the solution to an Anilox micro-engraved metering roller with which it is in circumferential contact. The solution is distributed into discrete doses in the engraved patterns of the roller. The Anilox roller then transfers the doses of solution to a printing roller by which they are applied to the tea bag material. In this example, the metering of the solution was such that a wet film weight of 2g/square metre was applied. This equates to an oil distribution of 0.34g per square metre.

The printing roller ensures that the capsules are pressed into intimate contact with the tea bag material so that they are embedded into the material fibres. The gums within the capsule coatings ensure effective adhesion of the capsules to a plurality of fibres of the material.

Once printed, the majority of the water is absorbed into the tea bag material although some may evaporate during and after the printing process.

The bag material was then formed, filled and sealed using conventional apparatus and processes. Tea-bags of 65 square millimetres were formed. With each bag having two sides the total surface area of each bag was  $0.00845 \text{ m}^2$  and therefore an average  $0.00287 \text{ g}$  of flavouring oil per bag was applied. The tea bag was filled with approximately  $2.2 \text{ g}$  of tea leaves before being sealed.

The infused tea bag gave a brew of similar strength to teas manufactured according to conventional methods but without the loss of top notes of the flavouring oil.

In a second embodiment the micro-encapsulated flavouring particles are formed by compounding a suitable polysaccharide such as a modified starch or cyclodextrin with the flavouring oil and are then suspended in an aqueous solution to form a printable solution as before.

A specific embodiment of the micro-encapsulating process is described, by way of example only, with reference to the following example.

#### EXAMPLE 2

An n-octyl succinate modified starch grade, having both hydrophilic properties conferred by the hydroxyl groups along the starch backbone and hydrophobic properties conferred by the n-octyl succinate modifications, was used in attempt to form encapsulated flavour units in a aqueous environment as described below.

$25 \text{ g}$  of modified starch was dissolved in  $75 \text{ g}$  of water at room temperature. A flavouring oil (lemon) was added to the solution, with stirring, in a starch:oil ratio of between 6:1 and 1.5:1. Homogenisation of the resulting emulsion produces a stable emulsion, with no visible separation over prolonged standing. The emulsions resulting from homogenisation were found to be of higher viscosity than desirable for subsequent printing, but it was found that the viscosity could be reduced simply by addition of extra water.

The encapsulated flavour units are thus already in an aqueous delivery system, which is suitable for printing directly on to the tea bag material, the polysaccharide backbone of the modified starch adhering to the cellulosic material of the bag. When

the tea bag is infused, the encapsulated flavour units start to break down resulting in the flavour oil being released gradually into the infusion.

It will be appreciated that the present invention has application not only to tea bags but also other infusions in which a product to be infused is held by a porous carrier. For example, filter papers used in the brewing of coffee or other beverages.

It will also be understood that any appropriate controlled dosing process may be used to apply the encapsulated particles in solution to the tea bag material. For example, spraying may be used without risk of evaporation of the flavouring. Moreover, there are many alternative metered printing configurations that may be used instead of that described in the example described herein. These alternatives will be evident to the skilled person in the art.

**CLAIMS**

1. A process for the flavouring or aromatisation of a product to be infused comprising the steps of producing encapsulated particles of flavour, bonding the particles to a porous carrier using a dosing process to control the distribution of particles on the carrier, and introducing the product into the carrier, characterised in that the dosing process is a metered printing process.
2. A process according to claim 1, wherein the carrier is a cellulose-based material.
3. A process according to any preceding claim, wherein the flavouring is encapsulated by a capsule that is soluble in water within a predetermined temperature range.
4. A process according to any preceding claim, wherein the flavour is encapsulated in a polysaccharide that has adhesive properties.
5. A process according to claims 3 or 4 wherein the polysaccharide is a modified starch.
6. A process according to claim 5 wherein the polysaccharide is an n-octenyl succinate modified starch.
7. A process according to any one of claims 4 to 6, wherein the encapsulant material also performs as an emulsifier during the production of the encapsulated particles of flavour.

8. A process according to any one of claims 1 or 2, wherein the flavouring is encapsulated by a capsule that is frangible within a pre-determined temperature range.
9. A process according to claim 8, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said pre-determined temperature range so as to induce rupture of said capsule.
10. A process according to claim 8 or 9, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.
11. An infusion product comprising a porous carrier containing matter to be infused and encapsulated flavour particles bonded to said carrier by using a metered printing process that controls the distribution of particles on the carrier.
12. An infusion product according to claim 11, wherein the encapsulated flavour particles comprise an outer capsule of polysaccharide with adhesive properties.
13. An infusion product according to claim 12, wherein the polysaccharide is a modified starch.
14. An infusion product according to claim 13 wherein the modified starch is an n-octenyl succinate modified starch.
15. An infusion product according to claim 14, wherein the polysaccharide is a natural gum.

16. An infusion product according to claim 15, wherein the capsule is frangible within a predetermined temperature range.
17. An infusion product according to claim 16, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said predetermined temperature range so as to induce rupture of said capsule.
18. An infusion product according to claim 16 or 17 wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

## AMENDED CLAIMS

[received by the International Bureau on 24 August 2000 (24.08.00);  
original claims 1, 3, 7, 8, 9, 12 and 15 amended; other claims unchanged (3pages)]

1. A process for the flavouring or aromatisation of product to be infused comprising the steps of producing encapsulated particles of flavour, bonding the particles to a porous carrier using a dosing process to control the distribution of particles on the carrier, and introducing the product into the carrier.
2. A process according to claim 1, wherein the carrier is a cellulose-based material.
3. A process according to claim 1 or 2, wherein the dosing process is a metered printing process.
4. A process according to any preceding claim, wherein the flavouring is encapsulated by a capsule that is soluble in water within a predetermined temperature range.
5. A process according to any preceding claim, wherein the flavour is encapsulated in a polysaccharide that has adhesive properties.
6. A process according to claims 4 or 5 wherein the polysaccharide is a modified starch.
7. A process according to claim 6 wherein the polysaccharide is an n-octenyl succinate modified starch.
8. A process according to any one of claims 5 to 7, wherein the encapsulant material also performs as an emulsifier during the production of the encapsulated particles of flavour.

9. A process according to any one of claims 1 to 3, wherein the flavouring is encapsulated by a capsule that is frangible within a pre-determined temperature range.
10. A process according to claim 9, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said pre-determined temperature range so as to induce rupture of said capsule.
11. A process according to claim 9 or 10, wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.
12. An infusion product comprising a porous carrier containing matter to be infused and encapsulated flavour particles bonded to said carrier by using a dosing process that controls the distribution of particles on the carrier.
13. An infusion product according to claim 12, wherein the encapsulated flavour particles comprise an outer capsule of polysaccharide with adhesive properties.
14. An infusion product according to claim 13, wherein the polysaccharide is a modified starch.
15. An infusion product according to claim 14 wherein the modified starch is an n-octenyl succinate modified starch.
16. An infusion product according to claim 13, wherein the polysaccharide is a natural gum.
17. An infusion product according to claim 16, wherein the capsule is frangible within a predetermined temperature range.



18. An infusion product according to claim 17, wherein the flavouring in the capsule is designed to increase in internal vapour pressure within said predetermined temperature range so as to induce rupture of said capsule.

19. An infusion product according to claim 17 or 18 wherein the capsule has a gum-based coating that is designed to weaken in said temperature range so as to induce rupture of said capsule.

# DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION



☐ Declaration submitted with Initial Filing

☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16(e)) required)

Attorney Docket Number

7434-2

First Named Inventor

John Robinson

## COMPLETE IF KNOWN

Application No.

Filing Date

Group Art Unit

Examiner's Name

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

## FLAVOURING OR AROMATISATION OF AN INFUSION

the specification of which (check one)

☐ is attached hereto.

☒ Was filed on March 27, 2000 as United States Application No. or

PCT International Application No. PCT/GB00/01160

☐ And was amended on \_\_\_\_\_ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				Yes	No
PCT/GB00/01160	PCT	03/27/00		<input type="checkbox"/>	<input checked="" type="checkbox"/>
GB 9906899.1	GB	03/26/99		<input type="checkbox"/>	<input checked="" type="checkbox"/>

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)

☐ Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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